Feb. 6, 1934. H. M. STEPHENSON 1,946,296

CONTROL MEANS FOR HIGH FREQUENCY APPARATUS

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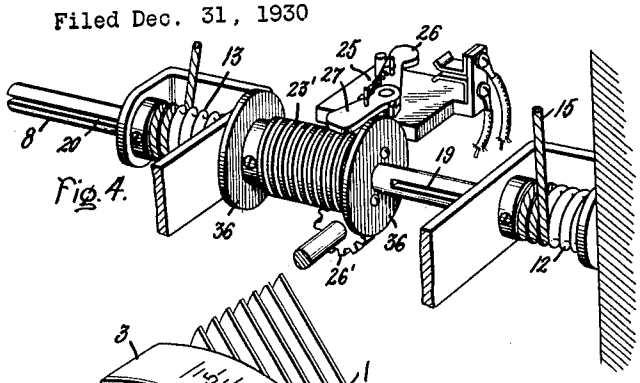


Fig. 4.

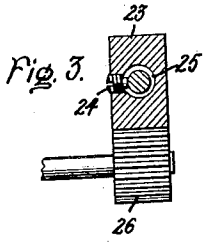


Fig. 3.

Fig. 1.

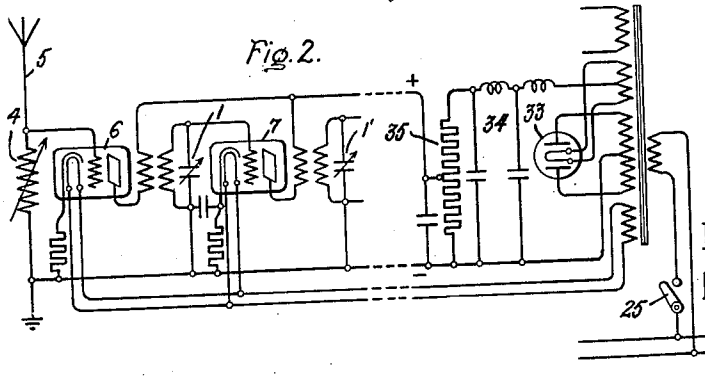


Fig. 2.

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CONTROL MEANS FOR HIGH FREQUENCY APPARATUS

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Serial No. 505,839

3 Claims. (Cl. 250—20)

My invention relates to control means for use in connection with high frequency apparatus, and more particularly for use in connection with radio broadcast receivers, whereby the adjustments necessary to desired operation of the apparatus may be conveniently effected.

My invention has for one of its objects to provide means whereby the number of controls, knobs, levers, etc., which are normally mounted upon the control panel of the high frequency apparatus may be reduced, and whereby the necessary adjustment normally effected by these controls are effected with increased convenience.

In radio broadcast receivers as now commonly constructed at least three controls are provided upon the escutcheon, one of the controls comprising a knob arranged to adjust a station selector, which may comprise a condenser or variometer arranged to adjust the apparatus to operate at the wave lengths of the different stations from which reception is desired; another control comprising a second knob arranged to control a rheostat, potentiometer, or other element of the circuit, thereby to adjust the volume of output from the receiver, and a third control comprising the handle of a switch arranged in the energizing circuit of the apparatus whereby the receiver is turned "on" and "off".

An object of my invention is to provide means whereby the adjustments made by these various controls may be effected by means of a single knob arranged upon the escutcheon. A further object of the invention is to provide means whereby each of these adjustments may be selectively effected in response to distinctive movements of the single knob, or the single shaft upon which the knob is mounted. In this way the facility with which the desired adjustments are made is materially increased, it being possible for the operator merely to grasp the single knob with one hand and rapidly effect all of the adjustments necessary to energize the set, select a desired station and adjust the equipment to the desired volume.

A further object of the invention is to provide means whereby the difference in sensitivity of the apparatus when adjusted for different wave lengths is automatically compensated for during adjustment of the station selector.

A further object of the invention is to provide simple and economical means whereby these results are accomplished.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 represents an embodiment of my invention; Fig. 2 represents a high frequency apparatus to which my invention may be applied; Fig. 3 represents a detail thereof; and Fig. 4 represents a modification.

Referring to the drawing, I have shown at 1 a variable condenser which may, for example, be utilized as the station selector of a radio broadcast receiver. This condenser may suitably be mounted in the receiver behind an escutcheon which I have indicated at 2 and has a calibrated dial 3 which may be visible through an opening, not shown, in the escutcheon 2. At 4 I have indicated a rheostat or potentiometer which may be connected in the circuit of the receiving equipment in any desired way to effect control of the intensity of the output of the receiver when receiving signals or programs from any desired station.

In Fig. 2 I have shown a radio receiver in which these elements may be included to effect the adjustments necessary for desired reception. The receiver may comprise an antenna 5 from which signals are received and amplified by means of a pair of cascade amplifiers 6 and 7. To effect the desired selection of stations the input circuit to the amplifier 7 is tuned by means of a condenser 1 which may be that shown in Fig. 1. If desired, the input circuit to a third amplifier, or to a detector, not shown, may similarly be tuned by means of a condenser 1 which may, if desired, be mounted upon the shaft of the condenser 1. By rotation of the shaft of these condensers the circuits of the amplifiers may be tuned to the various wave lengths upon which the stations from which reception is desired operate.

To control the intensity of the output currents from the receiver the rheostat 4 may be connected between the antenna and ground, thereby to constitute a shunt path for the high frequency energy. Thus by varying the impedance of this path, the intensity of the received carrier waves which are amplified may be controlled and accordingly, the intensity of the output currents from the receiver may be adjusted as desired. Of course, the desired volume control may be effected in many other ways now understood by those skilled in the art.

In accordance with my invention, means are provided whereby the volume control rheostat 4

and the station selector 1 may be controlled by means of a single shaft 8 having a knob 9 mounted upon the front of the escutcheon or panel, and whereby the operator by grasping the knob 9 and producing distinctive movements thereof may select any desired station from which reception is desired, and control the intensity of the signals received therefrom. To this end the shaft 8 is mounted both for rotary and longitudinal movement. The shaft is mounted in bearings formed by members 10 and 11 which may be supported from the framework of the apparatus in any desired way. It will be seen that each of these members 10 and 11 have a U-shaped portion and that the shaft 8 extends through each arm of the U of each member, whereby four bearings are provided for the shaft. Between the arms of each of these U-shaped members is mounted a spirally grooved drum 12 and 13 respectively, these drums being mounted upon the shaft 8 for rotation therewith. The station selector is likewise provided with a drum 14 which is arranged in alignment with the drums 12 and 13. A cable 15 having its ends secured to the drums 12 and 13 in a manner not shown, extends from one of the drums 12 around the drum 14 and thence to the opposite drum 13, the opposite ends of the cable being wound about the respective drums 12 and 13 in opposite directions and lying in the spiral grooves. At about the middle point of the cable 15, a portion of the cable is inserted through a small opening in the circumference of the drum 14 to form an eye 16 within the drum. This eye is attached to a projection 17 on the opposite side of the drum by means of a spiral spring 18. This spring serves the purpose of holding the cable 15 under a desired degree of tautness throughout its entire length and further prevents any slipping of the cable upon any of the drums. It will thus be seen that by rotation of the knob 9 the cable 15 is wound off from one of the drums 12 and 13 and on to the other of these drums, thereby causing a desired rotation of the condenser 1.

This manner of control of the station selector is described and claimed in a co-pending application, Serial No. 196,742, of Donald R. DeTar, filed June 6, 1927, for Tuning device for radio apparatus, which is assigned to the same assignee as my present application.

In order to provide for adjustment of the volume control rheostat 4 by means of the shaft 8, this shaft is also arranged for longitudinal adjustment. Thus it will be seen that along those portions of the shaft upon which the drums 12 and 13 are mounted longitudinal grooves 19 and 20 are formed, the drums being attached to the shaft by means of set screws 21 and 22 which project into these longitudinal grooves but which do not securely grip the shaft against longitudinal movement. Thus as the shaft is rotated, these set screws are engaged by the shaft thereby causing the drums to rotate with the shaft. On the other hand, when the shaft is moved longitudinally as by operating the knob 9 to and from the escutcheon, the drums 12 and 13 are held in position by the members 10 and 11 against longitudinal movement, the screws 21 and 22 being merely displaced relatively to the grooves.

Between the drums 12 and 13 and upon the shaft 8 is mounted a rack 23. This rack is secured to the shaft for longitudinal movement therewith and against rotary movement, by means of set screws 24, which project through the rack and into an annular recess 25 in the shaft, as shown in Fig. 3, but do not grip the shaft against rotary movement. Thus the shaft may be freely rotated without movement of the rack 23 but carries the rack 23 with it when moved longitudinally. The pinion 26 mounted upon the shaft of the rheostat 4 cooperates with the rack 23 whereby the rheostat 4 is adjusted in accordance with longitudinal movements of the shaft 8.

It will thus be seen that the operator may grip the knob 9 and rotate the shaft to a position in which signals are received from a desired station. He may then move the shaft longitudinally, as by moving the knob 9 in or out, until the signals are received with desired intensity, these operations being performed by the one hand of the operator either successively or simultaneously and without removing the hand from the knob 9.

This arrangement possesses a further distinct advantage in that when the operator moves the knob 9 through a wide range as to select stations which are widely spaced apart upon the dial 3 of the station selector, he need merely press the knob inward slightly, then rotate it to the desired station and again pull it outward until signals are received with desired volume. In this way the unpleasant loud response of the equipment to intermediate stations upon the dial is conveniently avoided.

As an added expedient it is desirable that the system be so arranged that the receiver may be turned on or off also by manipulation of the single knob 9. This is effected in accordance with my invention by means of a simple toggle switch 25 having a contact member 26 arranged to cooperate with stationary contacts 27 mounted near the rack 23. The switch also has a control lever 28 which projects above the rack 23 and between two upwardly projecting studs 29 and 30 mounted in the top of the rack 23. These studs 29 and 30 are arranged sufficiently far apart to permit adjustment of the volume throughout the entire range, but are so arranged that upon extreme movements of the shaft in opposite directions they engage the lever 28 and thereby cause the switch to be operated respectively to its open and closed position. It will be seen that the switch contact member 26 and the lever 28 are mounted to extend in opposite directions from, and for rotation about, a common pivot 31, these members being biased toward each other by means of a spring 32. Thus when the shaft is moved outwardly to a sufficient extent to cause the stud 29 to engage the lever 28, and operate it beyond its center position, the spring 32 is then effective to close the switch with a snap action, thereby energizing the apparatus. When the knob 9 is pushed inwardly to the extreme limit of its movement the stud 30 engages the lever 28 and operates it past its center position where the spring 31 is effective to open the switch with a snap action.

The switch 25 is shown in Fig. 2 as connected in the alternating current circuit from which energy is supplied through a full wave rectifier 33 and smoothing network 34 to a potentiometer 35 from which the anode potential for the discharge devices 6 and 7 is derived.

In Fig. 4 I have shown a modification of my invention in which the rack 23 and pinion 26 are replaced by a rack in the form of a worm 23' and a pinion in the form of a worm wheel 26', the worm 23' being rigidly attached to the shaft 8 both for rotary and longitudinal movement. The purpose of this arrangement is to provide means for automatically compensating for differences in the sensitivity of the set when ad-

justed to operate at different wave lengths. Thus, for example, it frequently occurs in radio receivers that as the station selector is rotated from one position to another, as from a position corresponding to a high frequency to one corresponding to a lower fresuency, some adjustment of the volume control is necessary to compensate for the difference in sensitivity of the receiver at the different frequencies. In accordance with the modification shown in Fig. 4, this compensation is automatically accomplished by means of the worm 23' and worm wheel 26'. Thus the pitch of the worm should be determined by the difference in sensitivity of the set at different frequencies. This worm and worm wheel also serve the purpose of the rack and pinion of Fig. 1 when it is desired to adjust the volume control by means of longitudinal movement of the shaft 8. If desired, of course, the worm may be made with zero pitch whereby it acts only as a rack.

To provide means whereby the switch 25 is operated in response to extreme movements of the shaft 8 in the modification of Fig. 4 end washers 36 are suitably attached to the ends of the worm 23', these washers having a radius somewhat longer than the radius of the worm 23'. The switch lever 28 is arranged above the worm 23' and between the two end washers whereby as the shaft 8 is operated to the right it is engaged by left hand end washer thereby causing the switch to be closed, and when it is moved to the left it is engaged by the opposite end washer causing the switch to be opened. Thus these washers serve the function of studs 29 and 30 of Fig. 1.

In the manipulation of the knob 9 of either Fig. 1 or Fig. 4, it will be observed that the volume control device and station selector may not only be controlled selectively in response to distinctive movements of the shaft, but also both may be operated either simultaneously or successively. Thus the knob 9 may be operated longitudinally of the shaft at the same time that it is rotated to select a desired station. This operation of the device is comparable with simultaneous operation of the separate controls of the volume control device and station selector of the receiver of the prior art with the two hands of the operator, the present device having the advantage that both adjustments may be made with increased rapidity and facility with the one hand.

It will be noticed that the arrangement of Fig. 1 is such that in turning the set "off" it is necessary to push the knob inward thereby to reduce the volume of output before deenergizing the set thereby avoiding sudden interruption of signals or programs, which may be being received at the time with loud intensity. In turning the set "on" the knob 9 will be operated to the maximum volume position. This, however, is unobjectionable since the time required for heating the cathodes of the tubes permits a sufficient time for subsequent desired adjustment of the volume control or to prevent an abrupt starting of sound from the loud speaker.

While I have shown a particular embodiment of my invention it will of course be understood that I do not wish to be limited thereto since many modifications may be made in the mechanical arrangement shown and in the instrumentalities employed and that I contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination, in a radio receiver, tuning means for said receiver, volume control means for said receiver, a shaft arranged for both longitudinal and rotary movement, a rack arranged for longitudinal movement with said shaft and arranged to be free from rotary movement of the shaft, a pinion cooperating with said rack, means for controlling one of said first means in response to rotation of said pinion and for controlling the other of said means in response to rotation of said shaft, an energizing circuit for said receiver including a toggle switch, and means carried by said rack to cooperate with said toggle switch to open and close said switch respectively upon extreme movement of said rack in opposite directions.

2. The combination, in a high frequency receiver, means for adjusting the wave length at which said receiver operates, continuously variable means for selectively adjusting the volume of output from said receiver when operating at any wave length, and means responsive to adjustment of said first means over a range of wave lengths automatically to adjust said second means sufficiently to compensate for differences in sensitivity of the receiver at the different wave lengths.

3. The combination, in a radio receiver, adapted to operate at different wave lengths, a wave length selector, a volume control device, a shaft arranged for rotary and longitudinal movement, a worm rigidly fixed to said shaft, a worm wheel cooperating therewith, means responsive to rotary movement of said shaft to control said wave length selector, and means for controlling said volume control device in accordance with rotary movement of said worm wheel, said worm having a pitch determined in accordance with the difference in sensitivity of said receiver when operating at different wave lengths whereby upon operation of said wave length selector said volume control device is automatically adjusted to compensate for variations in sensitivity of the receiver at the different wave lengths selected.

HUGH M. STEPHENSON.